DOCUMENT RESUME

ED 430 112 CE 078 613

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TITLE	Technology Education versus Liberal Arts Education?
PUB DATE	1999-03-00
NOTE	13p.; Paper presented at the Annual Conference of the International Technology Education Association (61st, Indianapolis, IN, March 28-30, 1999).
PUB TYPE	Opinion Papers (120) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	*Academic Education; *Educational Philosophy; Educational Practices; Educational Trends; Futures (of Society); Higher Education; *Integrated Curriculum; *Liberal Arts; Secondary Education; *Technology Education

ABSTRACT

A dichotomy is often seen between liberal arts or academic education and technology education. Practitioners of each school often feel in competition with each other for students and resources. There is, however, common ground on which to build an educational approach that eliminates the sharp cleavage between liberal arts education and technology education. One starting point is the idea that all academic disciplines have a world-view in mind. In addition, the practice of any discipline implies the guidance of certain principles, which can be found in liberal arts as well as technology. Given equally valued world-views and principles, the educational process and system can be seen as a continuum. In the continuum model, liberal arts and technology are not different components but different perspectives to address the same reality. For the future, a continuum model must be developed that includes the teacher as a master and mentor, multiple curriculum entry points, and integrative core courses. (KC)

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ED 430 112

ITEA 61st Annual Conference
Indianapolis, Indiana
March 28-30, 1999

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TECHNOLOGY EDUCATION VERSUS LIBERAL ARTS EDUCATION?

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INTRODUCTION

From 330 B.C., when Aristotle cracked a nut with a leveraged nutcracker, until now, when nutcrackers hang from Christmas trees around the world, the nutcracker has been both practical tool and an artistically-crafted symbol. The nutcracker is a tool, is art, is a symbol. Yet, we cannot say when or where the nutcracker transforms itself from a piece of work to a piece of art and into a cultural symbol. Furthermore, the nutcracker is an artifact, a pristine example of a technological device. And, these are the eyes that we want to propose to Technology Education. A teaching model about the world as a unity with as many dimensions as we want to see.

However, the reality of our educational system considers Technology Education a subject matter in competition with others. All of them compete for the allocation of resources and students attention. In this context, we attempt to analyze and evaluate the positioning of Technology Education in the common ground of the traditional classical Liberal Arts education. We want to propose ways throughout which Technology Education and Liberal Arts Education can enrich each other. And, we want to explore curriculum ideas that can appropriately provide space for classical Liberal Arts disciplines and Technology Education as well.

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1. THE DIFFICULT ENCOUNTER

Liberal Arts Education.

From the traditional point of view of Liberal Arts, technology is a tool. And, a tool is something we use to tackle the real matter. The tool itself is not substance; it is not the issue; it is an accessory. Then, technology is left to the craft maker while critical thinking people address the real issues of the world.

Given this context, it is difficult for Liberal Arts disciplines to engage technology seriously. To their subject matter, technology issues have been traditionally alien. Maybe an artifact or a technical issue becomes a case study to a discipline but technology itself cannot be a subject matter.

As a result, to the practitioners of Liberal Arts disciplines, technology is the realm of the tools they can reach out for helping in their work. At the best, they see artifacts as a necessary condition to their real work.

Then, no wonder that technology has been absent from the core of Liberal Arts education. Technology is useful, but it is not a discipline subject. Therefore, Technology Education is seen as a training process that provides students with the necessary skills to handle tools. Technology Education should be allowed a curriculum share for the sake of providing students the skills to turn to the real education experience. Accordingly, Technology Education does not belong to the core of Liberal Arts.

Nevertheless, it happens to be that the only distinction between a critical thinker creature and a no one is the artifacts surrounding the thinker. The least we can say is that there is a correlation between thinking critically and getting artifacts around. Somehow, it seems that thinking and making are the way of being of this thinking creature. And, perhaps critical thinking is an applied version of the making abilities of this so-called human creature.[1]

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[1] For a philosophical development of this idea: **The Question Concerning Technology and Other Essays**, by Martin Heidegger, Harper Publishers, 1977.

Technology Education is general education for a technological world. As we view it, Technology Education has non greater claim on human competencies than, say, language or mathematics. Technology, language, math all pervade the human experience. Yet, the group design and problem-solving activities that characterize technology education do provide an excellent setting for developing qualities like work habits, decision-making skills, effective use of resources, skills to interact positively with others, and ability to locate, evaluate and act upon information of all kinds.[2] All these skills are at the core of Technology Education and all are transferable not only to the workplace, but to being a competent person as well.

Technology Studies.

From the point of view of traditional Technology Education the emphasis has been of vocational education. Technology Education addresses the "real" world with "hand-on" methodology that prepare students for "jobs." Liberal Arts education is just a necessary background that provides the "tools," e.g. to read, to write, to count, that allows the understanding and handling of technology. Or, worse, Liberal Arts is just a required pork ticket to reach a job.

Given this context, there is very little a role to Liberal Arts. Reality is what is done and the making is the real. Liberal Arts is a luxurious activity only possible as far as technology provide a material foundation. Aside from the "facts" provided by science, civilization could be perfectly possible without Liberal Arts activities.

Then, Technology Education becomes the realm of the makers. Whatever enhance our abilities to improve manufacturing is "useful." Liberal Arts education would be necessary insofar it provides the necessary tools to learn technical skills and as addendum for "educated person" status.

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[2] For a detailed analysis of contemporary competency: "Career Development and Workforce Preparation: educational policy versus school practice." **The Career Development Quarterly**, September 1996, pp. 20-37.

2. EDUCATIONAL MODELS

From the sharp dichotomy Liberal Arts/Technology Education, very formal and pervasive models of education have derived during the last two centuries. Those models reflect these views of the two fields. Furthermore, the models institutionalized those views making any departure from them extremely difficult.

Liberal Arts/Vocational.

This model openly exposes the basic tenants of Liberal Arts advocates. It believes in a sharp distinction between critical thinking and manual arts. Therefore, the educational system is really a bi-system. One system addresses the classical discipline of arts and sciences, the other, the craftsmanship necessary in technical labors. The system became even a social class system of education. The elite social classes attend Liberal Arts school and the working classes attend the vocational schools.

Scientific/Humanistic

Given the proliferation of scientific disciplines and the glamour of scientific inquiry, scientific education reached maturity as a model in itself. At this point, Liberal Arts education splits in two distinctive fields: science and humanities. The twentieth century has been the scientific century, therefore, the prestige of scientific education. Somehow, humanities have fought its way out during this low time.

Where is it Technology Education in this model? The scientist knows well how much relies on technical tools. Therefore, scientists have been the strong advocates of Technology Education as "applied" studies. Somehow, Technology Education obtained certain status as the servant of the prestigious scientific field.

Thus, this model advanced more the idea of differentiated field of education. Now, we have the people that are going to really understand the world, the scientifically educated; the people who will operate this scientific environment, technicians; and the dreamers and nostalgics.

Professional/Universal

The complexity and diversity of modern society created the need for people able of addressing many different complicated tasks. These tasks are functional to society and require certain common ground of knowledge in order to perform them. Lawyers, physicians, policemen, teachers are typical representatives of people involved in a common task that we consider the field of a profession.

The educational system responded to this reality with the creation of the professional education. In this case, the driven force for the shaping of the curriculum is what educator planners and people doing those tasks consider it is important to know. Then, curricula are clusters of courses coming from disciplines pertaining to science, humanities, and technical skills.

Where is it Technology Education? Obviously, technology education will provide courses according the need of the profession. Not many courses to those professional programs that call for many scientific or humanities courses. More courses to those professional programs that require a more "hand-on" approach. Technology Education finds its justification solely as a "service" field for professional education.

Then, whatever and whenever an educational effort falls outside of a professional field it becomes a "universal" educational field. Nowadays, this is very much what we understand by Liberal Arts education. In an educational program oriented toward universals, Technology Education is needed not more than knowing to drive a car is needed.

We grew up believing that the high-status jobs were traditional professional jobs: architect, engineer, lawyer, doctor. The irony is that much of the skills of those professions will be reducible to zeros and ones in the next century. Parallel computing capability will take care of those tasks. But, keeping the service of those computers will be the challenge. And, service is not the computer itself, no the machine, but the technology system that provides the service. To understand and manage this system requires a great deal of Technology Education. The contribution to society of the third sector, services, was put at the bottom of the society during the Industrial Era. Now, they promise to be the most intellectually challenging and technically difficult of the

future.[3]

3. AN INQUIRY IN COMMON GROUND

Our proposition is to look for common ground on which to build an educational approach that eliminates the sharp cleavage between Liberal Arts Education and Technology Education. We are looking for a ground in which natural sciences, social sciences, humanities, and technology feel as their own ground.

World-view models.

Our starting point is the idea that all academic disciplines have a world-view in mind. No matter how small the focus of the lenses, they see the whole world throughout those lenses. If that is the case, to say that the world view of one discipline is "better" than the one of another, it is like to say that one believe system is "better" than another. We would put ourselves in a position where we cannot identify the "betterness."

Then, our proposition is to accept the idea that each discipline carries out a world-view that deserves the same academic respect. This respect would be tested when confronting an issue. The day we think that all issues must be thought in conjunction to colleagues from different fields, we will be really serious about their views.

On this respect, Technology Education has a world-view that can only be enriched and to enrich others in a thinking together environment. Technology is as ancient as civilization, therefore, there is a "technological" view of the world. This lens of technology would be empowered and it will empower others if we see others lenses more than just tools to support our lens.

Principles.

The practice of any discipline implies the guidance of certain principles. Each of us knows that the set of principles we follow is

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[3] For an analysis of the impact of technological changes on the society, specially workforce: **The End of Work: Technology, Jobs and Your Future**, by Jeremy Rifkin, 1996.

useful to the progress of our discipline. We know other disciplines have their own principles and probably they are useful in their endeavors. Usually, we do not care very much about the principles of others. However, principles shape the soul of a practitioner.

Technology cultivates an intellectual domain. It has a body of knowledge about how people create, produce, use, and assess human-made artifacts. Technology has a mode of inquiry that focuses on creating. Its models of inquiry center on the practices of invention, innovation, and design. The modes of inquiries are doing actions and creating actions. They also play an important part in understanding and studying technology. Technology evolves; it has a long recorded history from the Stone Age to the Industrial Age followed by the Information Age. All this asset means that the study of technology is fundamental to being an educated person. And, this fact comes about only when the study of technology is viewed as equally important as the other recognized academic disciples.

It would help all teachers enormously to learn about the basic principles that guide the inquiries of others disciplines. In the first place, we will see other practitioners very much in our shoes. Secondly, we would learn more about our own set of principles. Anyway, if we are serious about common ground, we should start for trying to understand the practices of others disciplines.

Education as a continuum.

Given equally valued world-views and principles, we can see the education system and educational process as a continuum. In a continuum, we move from one discipline to another not as from one discrete point to another, but as observers from different perspectives. Liberal Art and Technology Education would not be different compartments, but different perspectives to address the same reality.

In a continuum model of education we would need to address any issue from the Liberal Arts and Technology Education points of view simultaneously. Liberal Arts and Technology Education would engage each other. They will engage each other not only for the sake of knowing and understanding the other, but for the sake of accomplishing their own aims. We should learn that we cannot address what we must by just getting involved in our own world-view.

Education as a continuum is not symbiosis or syncretism. Liberal

Arts and Technology Education maintain their own identities, but they realize that they cannot educate the educand of the future own their own. Liberal Arts will learn that tools not only enhance human physical abilities, but also shape human comprehension abilities. Technology Education will learn that Liberal Arts is not only about reflecting reality, but also about seeing reality. Education as a continuum is not about jointing efforts, but about intellectual honesty.

Instructional models.

Assuming a common ground for Liberal Arts education and Technology Education, we can think about common instructional models. Instructional models should not share a common background because we try to work together. Rather, we should reach the point at which the use of a common background model is due to the need of our own field either Liberal Arts or Technology Education.

4. CONCLUSION: BUILDING UP AN EDUCATIONAL MODEL FOR THE FUTURE

The Promise of High-Tech.

It was said that television was going to change schools, even displace the teacher. Teachers are still here, competing for student attention with television shows, but still here. Therefore, there is reason for skepticism about the threat of high-tech to the teacher. Actually, precisely because of high-tech we think there are reasons for more teachers, yet another kind of teacher. The dilemma is nobody knows exactly how this "new" teacher will look like.

Information technologies development is the key about the high-tech impact on education. Traditionally, the person of the teacher itself was the main source of reliable information to students. The teacher was the authoritative conveyor of information, not anymore. Nowadays, any student can gather more information in a short time than the one the teacher had gathered in his/her lifetime. However, information is not knowledge and certainly not wisdom at all. The handling, the managing, the rumination of information is becoming the big challenge of the educational process. To "navigate" with the student throughout this ocean of information it is becoming the big challenge for the teacher.

Master/Mentor/Facilitator

No doubt High-Tech is changing the nature of teaching and the profession of teaching. Today, the role and model of the teacher of the future are highly debated. We do not have the answer and we think it will take a long time before we have certain consensus about the "new teacher."

Meanwhile, we are working on the idea of the Master/Mentor/Facilitator. We think this idea collect the best of the tradition and of the "new." The master conveys the traditional idea of the teacher as the knowledge/wisdom authority. In this age of falling idols and role models, maybe more than before the student needs someone beyond a screen to look at as someone that "knows." The mentor brings the idea of the lighthouse. In this fast pace era where the environment and support institutions move quickly, the need of the couch, of someone always there for encouragement and guidance is increasing. Finally, who is going to "navigate" with the student in the middle of this high-tech new school. We need the facilitator.

Therefore, the "new" teacher will have to handle the high-tech environment, from the pen to the internet passing throughout the book, in order to fulfill the role of facilitator. In addition, the guidance role of the teacher should be emphasized. Yet, the teacher will still be the commissioner of a discipline whether traditional or not. It has to convey the meaning and excitement of a subject matter.

Multi-Curricula

The ideal is a curriculum with many entries. There would be as many curricula as students. No matter the entry, the students would have the chance to grasp the core of traditional and new disciplines and end with a specialization on his/her own.

Meanwhile, we see two approaches to the integration between Liberal Arts and Technology Education. One approach calls for Technology Education courses that are tailored as part of the general education curriculum. There are courses with certain tradition that follow this pattern. The specific educational institution considers whether or not to accept these courses for general education requirements purposes. Courses such as Technology and Society, Technology and Culture, Technology and Civilization are typical examples of this approach. There

are also new course developments that more specifically address the issues of integration and Technology Education as part of the Liberal Arts curriculum.[4]

A second approach, which we are proposing, attempts a more integrative manner. The idea is making Technology Education a component of integrative core courses curricula. Integrative core courses are developed around an integrative topic to which many disciplines, therefore teachers, contribute. We think, there is no topic about nature or humanity, physics or metaphysics to which Technology Education is alien. Furthermore, Technology Education should come with its own topics for integrative core course development.[5]

Integrative core courses are more adequate to the multi-curricula idea. The integrative core course idea is not a renegotiation of educational resources allocation, especially time curriculum. The issue is not the sharing of resources among the different disciplines, including Technology Education. The issue is a new curriculum and course structure that better addresses the educational needs of the educand.

In order to stay globally competitive, economic, social, and political institutions will need people with cross-disciplinary training. People will have to fulfill multiple roles, creative and critical thinker, quality manager, team player. This new type of person must be able to fulfill roles in assisting the design, development, testing, trouble shooting and maintenance of new technological devices at home, in the workplace, and community institution.

Competency prospects are poor for people who do not pursue further education. And, technology is the single factor most influential in all the change with which society is trying to cope with. It seems, therefore, that Technology Education should be at the center of the effort to try to make education relevant. But just as it is not computers and gene-splitting per se that change the world, neither will

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[4] As examples of this kind of efforts, we can mention **Technology as Liberal Education. A Model Course**, by The ITEA Task Force on Technology Education as Liberal Education (1993); and **Exploring Technology**, by Leonard F. Sterry and Robert W. Hendricks, T&E Publications (1997).

[5] We are working one example of a technology integrative core course around the concept of making.

computers nor high-tech training really help prepare students for the future. It is the evolving nature of technology and the ways in which society reacts to this state of change that hold the clues for making education more effective. Technology Education's characteristic design process, its humanistic perspective, its scientific support, and its integrative nature make our discipline an ideal setting for exploring new curricula.

Integrative core courses are difficult to develop. They are more than a lecture series like course around a common topic delivered by instructors from different disciplines. They are a group of instructors from different disciplines addressing a common topic. We think that the solving/problem model of technology has prepared well the Technology Education instructor for this task. A well-understood solving/problem approach requires a group of people with different background tackling together an issue. The Technology Education instructor should be a member of the team of instructors from different disciplines that are addressing the same topic of any core integrative course. Furthermore, the Technology Education instructor should come forward with technology topics for integrative core courses.

While some may see the entire world as a stage, Jones (1997) sees the entire world as a classroom and every "one room hut" as an access point in the age of information.[6] Much of what is involved in curricula and educational change is above and beyond any plans or controls. The global culture is progressing at a speed that put the educational model for the future outside the bounds of any grand design. Nevertheless, this is not a justification for giving up or for business as usual. If lofty ideals and profound philosophical commitments are not powerful enough to generate the needed transformation of our curricula, the outside reality might be. While teachers of all types have historically urged changes on society and its institutions, we have been reluctant to change ourselves. If the educational system of which we are part will not make fundamental changes, a new system of education will replace the traditional school model. And, we believe that our own experiences provide extremely valuable advice for change. Let us finish with a quotation that make the point:

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[6] **Cyberschools: An Education Renaissance**, by Glenn R. Jones, Englewood, CO: Jones Digital Century, Inc., 1997.

"I am reminded of a new technology teacher who began her fist teaching job in a classroom that had no equipment for the first two months. In those first two months, however, her students were guided through problem-solving activities, technology-awareness games, simple experiments, and even philosophical discussions about technology. Once the equipment arrived, she found herself teaching primarily about how to use the equipment, and her students spent more time sanding than thinking. In looking back, she remarked that she did more technology education in those first two months than she did in the rest of the school year."[7]

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[7] Jim Flowers, "Teaching the Historical Perspective - Should We or Shouldn't We?," in **The Technology Teacher**, December/January 1998, pp. 7-9.